

ONTARIO WATER RESOURCES COMMISSION

1970 Cottage pollution control program - Stony, Clear and Lovesick Lakes.

1971.

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ONTARIO DEPARTMENT OF HEALTH
ONTARIO WATER RESOURCES COMMISSION
1970 COTTAGE POLLUTION CONTROL PROGRAM
STONY, CLEAR, AND LOVESICK LAKES

As a result of recommendations contained in the March, 1970 report on Environmental Management of Recreational Waters in Cottage Areas in Ontario, interdepartmental field surveys of Stony, Clear and Lovesick Lakes located in the Kawartha Lakes region were conducted during 1970.

Staff of the Ontario Department of Health's Public Health Engineering Service investigated on-shore private sewage disposal systems. A map showing the location of those systems which were found to be polluting or causing a public health nuisance is appended. Corrections are being carried out on these faulty systems. A detailed report on the work completed to March 31, 1971 will be published in the near future.

Staff of the Ontario Water Resources Commission's District Engineers Branch conducted water quality surveys during the periods of June 19 to 29, July 31 to August 10, and September 11 to 21, 1970. These 11-day surveys were timed to assess water conditions prior to, during, and following the height of the summer tourist season.

The bacteriological results were evaluated statistically by staff of the OWRC's Bacteriology Branch. The geometric mean densities of the bacterial parameters are shown on the appended map.

During the pre-tourist season survey, the bacteriological water quality generally met the OWRC bacteriological criteria for

total body contact recreational use. The fecal streptococci counts were highly variable at a few locations in all lake sections and were possibly due to natural (animal) inputs.

The mid-summer bacterial levels in the lakes are summarized as follows:

<u>LAKE</u>	<u>PARAMETER</u>	<u>BACTERIAL LEVELS</u> (Geometric Mean/100 ml)
Lovesick	Total Coliform Fecal Coliform Fecal Streptococcus	1095 to 1966 30 to 144* 7 to 89
Stony - Western section West of Hells Gate	Total Coliform Fecal Coliform Fecal Streptococcus	600 to 3400 20 to 132 10 to 210
Stony - Central and Eastern Sections	Total Coliform Fecal Coliform Fecal Streptococcus	300 to 800 2 to 65* 1 to 30
Clear	Total Coliform Fecal Coliform Fecal Streptococcus	160 to 1000 5 to 65 2 to 10

* With large fluctuations in daily counts.

During the mid-summer survey, the bacteriological quality of Lovesick Lake and Stony Lake west of Hells Gate did not meet the OWRC criteria. The results showed that fecal contaminants were entering these lake sections from the lakeshore as well as upstream sources. In general, the bacteriological quality of central and eastern Stony Lake met the OWRC criteria. However, the daily counts in these sections, particularly with respect to the fecal coliform bacteria, varied greatly, sufficiently so as to suspect sporadic fecal contamination. Also, on the basis of fecal coliform levels which varied from 115 to 173 organisms per 100 ml, water along the south

shore near McCrackens Landing was impaired. The flow from Jack Creek did not meet the OWRC criteria with respect to all three bacteriological parameters while only the total coliform level in Eel's Creek did not meet the OWRC criteria. The waters of Clear Lake generally met the OWRC bacteriological criteria.

During the post-tourist season survey, the total coliform levels did not meet the OWRC criteria for total body contact recreational use in Lovesick, western Stony, the west part of central Stony, and Clear Lakes. However, the lakes were apparently recovering from the bacterial load imposed on them by increased human activity during the mid-summer.

The surveys revealed that the dissolved oxygen content in the lakes' surface waters was above the minimum level designated by the OWRC for the preservation of warm water organisms.

Thermal stratification of the waters, a natural occurrence in many lakes, was observed during mid-summer in Lovesick Lake, eastern Stony Lake and Clear Lake. Although a temperature drop between top and bottom waters was measured in central Stony Lake in mid-summer, no zone of rapid temperature change (thermocline) was detected in this lake section.

By the time of the fall survey, thermal stratification in Lovesick and Clear Lakes had disappeared or was in the process of breaking down naturally. In eastern Stony Lake, the thermocline had not disappeared but had descended into the deeper waters, probably because of the lake's morphometry and great depth in this section.

Serious oxygen depletion was noted during the mid-summer survey in Lovesick and Clear Lakes below the thermocline and in the bottom waters of central Stony Lake; oxygen was absent in the bottom waters at the north end of Clear Lake. During the fall survey when the thermocline had disappeared, oxygen depletion in the bottom waters continued, although not as serious; the fall turnover of the lake waters introduced dissolved oxygen into the bottom waters. In eastern Stony Lake, the oxygen content near the bottom was observed to decrease as the summer progressed; here, the dissolved oxygen content below the thermocline varied from 60% to 65% saturation in the first survey, dropped to a range of 20% to 40% saturation in mid-summer, and was 3% to 5% saturation in fall. The tendency toward oxygen depletion in the bottom waters even when thermal stratification did not exist, is attributed to the strong oxygen demand of the decomposing organic matter in the bottom sediment of these lakes.

The chemical quality of the lake waters was generally satisfactory. The average hardness during the fall survey varied from 80 ppm in eastern Stony Lake to 92 ppm in western Stony Lake and Clear Lake; this is about two-thirds that of Lake Ontario.

The chemical data, which include nutrient levels, suggest that the eastern section of Stony Lake is the least productive of all lake sections studied. Other chemical constituents were generally less in magnitude in this lake section.

BACTERIOLOGICAL INDICATOR ORGANISMS

TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) Escherischia Coli (*E. coli*), which originate mainly in the intestines of man and other warm blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil but are also present in feces in small numbers. The presence of total coliforms in water may indicate soil run-off or, more important, less recent fecal pollution since organisms of the Enterobacter - Citrobacter groups tend to survive longer in water than do members of the Escherischia Coli group, and even to multiply when suitable environmental conditions exist.

The FECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and, therefore, are an indicator of recent fecal pollution. Most of the coliform bacteria found by the fecal coliform test are of the genus Escherichia Coli.

FECAL STREPTOCOCCI organisms are normal inhabitants of the large intestine of man and animals and generally do not multiply outside the human body. In waters polluted with fecal material, fecal streptococci are usually found along with fecal coliform bacteria but in smaller numbers. When the number of fecal streptococci bacteria approximates or is greater than the number of fecal coliform organisms, animals are the probable source.

The OWRC Guidelines and Criteria for Water Quality Management in Ontario (1970) indicate that water used for total body contact recreation can be considered impaired when the total coliform, fecal coliform, and/or fecal streptococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.



